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EXAMINER	
ZHE, MENG YAO	

ART UNIT	PAPER NUMBER
2195	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/677,159	LOWELL, DAVID E.	
	Examiner	Art Unit	
	MENGYAO ZHE	2195	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 February 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-67* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-67* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *1/21/2009*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-67 are presented for examination.

2. In view of the Appeal Brief filed on 2/5/2009, PROSECUTION IS HEREBY REOPENED. A new ground of rejection is set forth below. To avoid abandonment of the application, appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) initiate a new appeal by filing a notice of appeal under 37 CFR 41.31 followed by an appeal brief under 37 CFR 41.37. The previously paid notice of appeal fee and appeal brief fee can be applied to the new appeal. If, however, the appeal fees set forth in 37 CFR 41.20 have been increased since they were previously paid, then appellant must pay the difference between the increased fees and the amount previously paid. A Supervisory Patent Examiner (SPE) has approved of reopening prosecution by signing below.

Claim Rejections - 35 USC § 101

3. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

4. Claims 28-43 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

5. Claims 28-43 are rejected under 35 U.S.C. 101 because the claimed invention does not provide any tangible result. The virtual machine monitor is merely waiting there to virtualize the memory while no actual memory is being virtualized since the applicant never claims that runtime actually starts. Therefore, the state of the claim remains in the state of waiting for runtime to actually happen, and therefore does not provide any tangible result that would provide any real world use.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 1-12, 28-43 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

A. The claim languages in the following claim languages are unclear and indefinite:

i) Claim 1, it is uncertain exactly when virtualization happens <i.e. The applicant defined runtime as the period of normal execution of the OS after boot and before shutdown. It is unclear already from this statement

as to what the boot is referring to. Is it the boot of the OS or boot of the computer system that the OS is running on? It seems that the applicant meant the boot of the OS. Fig 2, step 210 however, virtualizes the memory at VMM bootup, and then at step 212, OS are booted to run. Therefore, while part of the specification indicates that virtualization begins at the time of VMM bootup, the applicant also states that virtualization begins at the time of the OS bootup, which, according to the specification, occurs AFTER the VMM bootup. So which is it?>

Claims 28, 36 have the same deficiencies as claim 1 above.

Double Patenting

8. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir.

1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

9. Claims 1, 28, 36 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 1 of Patent Application No. 10/676922 (hereafter Lowell) in view of Bean et al., Patent No. 4,843,541 (hereafter Bean) . Although the conflicting claims are not identical, they are not patentably distinct from each other because both methods comprise substantially the same elements.

10. As per claim 1 of this application and claim 1 of Lowell, they both teach Virtual machine monitor that commences virtualization at runtime.

The only difference between this application and Lowell is that this application teaches virtualization of memory whereas Lowell teaches virtualization of I/O devices.

However, it would have been obvious to one having ordinary skill in the art of virtual machines to see that the virtual machine monitor is capable of both virtualizing the memory and the I/O devices at the time of the applicant's invention since both are important features of a virtual machine monitor as proved and taught in Bean, for the purpose of providing the illusion to a guest virtual machine running on top of a virtual machine monitor that it has sole control of the computer resources thus allowing multiple guests to run on one single computer (Column 1, lines 26-43; Column 2, lines 25-45).

Therefore, it would have been obvious to one of an ordinary skill in the art at the time the invention was made to have the virtual machine monitor virtualize anything included in its capabilities, which includes memory and I/O devices.

As per claims 28, 36, they are rejected for the same reasoning as above.

11. Claims 13, 56 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 17 of Patent Application No. 10/676922 (hereafter Lowell) in view of Bean et al., Patent No. 4,843,541 (hereafter Bean) . Although the conflicting claims are not identical, they are not patentably distinct from each other because both methods comprise substantially the same elements.

The reasons for rejection is the same as rejection of claim 1 above.

12. Claims 1, 28, 36 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 1 of Patent Application No. 10/676557 (hereafter HP) in view of Bean et al., Patent No. 4,843,541 (hereafter Bean) . Although the conflicting claims are not identical, they are not patentably distinct from each other because both methods comprise substantially the same elements.

13. As per claim 1 of this application and claim 52 of HP, they both teach a Virtual machine monitor that performs virtualization at runtime.

The only difference between this application and HP is that this application teaches virtualization of memory whereas HP teaches virtualization of hardware.

However, it would have been obvious to one having ordinary skill in the art at the time of the applicant's invention that memory is a specific type of hardware and that a virtual machine monitor has the capability of virtualizing hardware that includes memory, as taught by Bean, for the purpose of allowing multiple guest virtual machines to run on a single computer (Column 1, lines 26-43; Column 2, lines 25-45).

Therefore, it would have been obvious to one of an ordinary skill in the art at the time the invention was made to have the virtual machine monitor virtualize any hardware included in its capabilities, which includes memory.

Claims 28, 36 are rejected with the same reasoning as claim 1 above.

14. Claims 13, 56 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 62 of Patent Application No.

10/676557 (hereafter HP) in view of Bean et al., Patent No. 4,843,541 (hereafter Bean) . Although the conflicting claims are not identical, they are not patentably distinct from each other because both methods comprise substantially the same elements.

The reasons for rejection are the same as claim 1 above.

Claim Rejections - 35 USC § 102

15. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

16. Claims 13-19, 56-62 are rejected under 35 U.S.C. 102(b) as being anticipated by Bean et al., Patent No. 4,843,541 (hereafter Bean).

17. As per claims 13, 56, Bean teaches a method of running a virtual machine monitor on computer hardware and an operating system on the virtual machine monitor, the hardware including memory, the memory virtualized by the virtual machine monitor, the method comprising devirtualizing the memory at runtime (Column 22, lines 47-55; Column 29, lines 33-55: memory resources that were originally mapped to a virtual

machine guest and is later remapped to the host is considered from being virtualized to being devirtualized, since the host uses real addresses while the virtual machine uses virtual addresses. Column 1, lines 50-58; Column 2, lines 1-11: the part of memory under direct control of the guest operating system corresponds to devirtualized memory since it does not need the VMM or VM host to translate it).

18. As per claims 14, 57, Bean teaches wherein a portion of the memory is devirtualized (Column 1, lines 50-58; Column 2, lines 1-11; Column 22, lines 47-55).

19. As per claims 15, 58, Bean teaches wherein when the operating system is booted, the virtual machine monitor exposes the booting operating system to physical memory no larger than machine memory, where the physical memory does not span any memory holes (Column 1, lines 55-58: for a V=R guest, the virtual address correspond directly to the real address, therefore it can't be larger than the machine memory.).

20. As per claims 16, 59, Bean teaches wherein the operating system defines virtual-to-physical translations prior to the runtime devirtualization (Column 30, lines 5-8); wherein the virtual machine monitor defines physical-to-machine translations prior to the runtime devirtualization (Column 29, lines 30-45); wherein the virtual machine monitor

composes dynamically the virtual-to-physical translations with the physical-to-machine translations prior to the runtime devirtualization, wherein the runtime devirtualization includes having the virtual machine monitor cease to perform the dynamic composition of translations (Column 22, lines 47-55; Column 29, lines 33-55: when the memory resource is assigned to a guest, composite translation is necessary, however, when it gets assigned to the host, that memory is devirtualized, and translation is no longer necessary.).

21. As per claims 17, 60, Bean teaches wherein the devirtualization includes remapping physical memory so a physical-to-machine mapping becomes an Identity mapping; and using the operating system to manage address translation with respect to the devirtualized memory (Column 29, lines 45-50; Column 30, lines 5-8).

22. As per claims 18, 61, Bean teaches wherein pages of physical memory that are already Identity-mapped are not remapped, and wherein at least some other pages of physical memory are remapped directly (Column 22, lines 47-55; Column 29, lines 33-55: memory resources that are already part of the host do not need to be remapped, only the memory that originally belonged to a guest needs to be remapped.).

23. As per claims 19, 62, Bean teaches wherein pages of physical memory that are already Identity-mapped are not remapped, and wherein at least some other pages of physical memory are remapped indirectly (Column 22, lines 47-55; Column 29, lines 33-55).

24. Claims 1, 28, 36 are rejected under 35 U.S.C. 102(b) as being anticipated by "Virtualizing I/O Devices on VMware Workstation's Hosted Virtual Machine Monitor", Lim et al., 2001 (hereafter VMware).

25. As per claims 1, 28, 36, Vmware teaches a method of running a virtual machine monitor on computer hardware, the hardware including memory, the method comprising waiting to commence virtualization of the memory until runtime (VMware, Section 1, Section 2, Section 2.1: the VMM is responsible for virtualization of memory and the VMM has to be loaded and running, therefore, if the VMM does not run, nothing is there to virtualize the memory).

26. Claims 1, 28, 36 are rejected under 35 U.S.C. 102(e) as being anticipated by Nelson et al., Patent No. 6,961,941 (hereafter Nelson).

27. As per claims 1, 28, 36, Nelson teaches a method of running a virtual machine monitor on computer hardware, the hardware including memory, the method comprising waiting to commence virtualization of the memory until runtime (Abstract; Column 1, lines 50-67).

Claim Rejections - 35 USC § 103

28. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

29. Claims 1-2, 4-12, 25-50, 54-55, 66-67 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bean et al., Patent No. 4,843,541 (hereafter Bean).

30. Bean was cited in the previous office action.

31. As per claim 1, Bean teaches a method of running a virtual machine monitor on computer hardware, the hardware including memory, the method comprising virtualization memory during runtime (Column 2, lines 25-40; Column 22, lines 47-55; Column 29, lines 35-50).

Bean does not specifically state waiting to commence virtualization of the memory until runtime. However, since the VM host, which corresponds to the virtual machine monitor, is responsible for virtualization of the memory, the virtualization of memory cannot happen until the VM host starts running (Column 2, lines 25-40).

32. As per claim 2, Bean teaches wherein the virtualization includes constructing an Identity mapping of physical to machine memory (Column 28, lines 33-41; Column 29, lines 35-50: Guest real address corresponds to physical memory, host absolute address corresponds to machine memory); and commencing to use the virtual machine monitor at runtime to manage memory translation (Column 2, lines 28-40: VM host corresponds to virtual machine monitor).

33. As per claim 4, Bean teaches wherein the memory translation is initially performed according to the Identity mapping (Column 29, lines 35-50).

34. As per claim 5, Bean teaches wherein the virtual machine monitor modifies the mapping after the physical memory has been virtualized (Column 22, lines 46-55).

35. As per claim 10, Bean teaches wherein only a portion of physical memory is virtualized at runtime (Column 22, lines 47-55: some memory resource may belong to host only, instead of guest and is hence not virtualized).

36. As per claim 12, Bean teaches performing runtime devirtualization of the virtualized memory (Column 22, lines 47-55).

37. As per claim 25, Bean teaches wherein the remapping is performed without a back map by constructing a list of the physical pages mapping to a page of machine memory by searching the physical-to-machine mapping (Column 29, lines 35-50).

38. As per claims 27, 55, 67, Bean teaches wherein managing the address translation includes having the virtual machine monitor cease to compose dynamically the operating system's virtual-to-physical translations with the virtual machine monitor's physical-to-machine translations for a portion of physical memory that is devirtualized (Column 22, lines 47-55; Column 29, lines 33-55: it is inherent that once the memory is devirtualized, the composite translation no longer occurs.).

39. As per claims 28, 36, Bean teaches a computer comprising memory including first and second portions, the first portion encoded with a virtual machine monitor that waits to commence virtualization of the second portion until runtime (Column 22, lines 47-55; Column 29, lines 33-55).

40. As per claims 29, 37, Bean teaches wherein the virtualization includes constructing an Identity mapping of physical to machine memory; and commencing to use the virtual machine monitor at runtime to manage memory translation (Column 29, lines 45-48).

41. As per claims 30, 38, Bean teaches wherein the virtual machine monitor modifies the mapping after the physical memory has been virtualized (Column 22, lines 47-55).

42. As per claims 35, 43, Bean teaches wherein only a portion of physical memory is virtualized at runtime (Column 22, lines 47-55: those memory resources belonging to the host is not virtualized.).

43. As per claims 6, 31, 39, Bean teaches wherein the memory translation is managed by allowing the operating system to define virtual-to-physical mapping

(Column 30, lines 3-8), and the virtual machine monitor to define physical-to machine mapping (Column 29, lines 44-50).

Bean does not specifically teach wherein an operating system is running on the virtual machine monitor prior to virtualizing the memory. However, since initializing the virtual machine monitor with its running operating system before setting any other guest virtual machines on top of the virtual machine monitor is generally well known in the field of virtual machines, it would have been obvious to one having ordinary skill in the art at the time of the applicant's invention to allow the operating system for virtual machine monitor to run prior to virtualization of the memory.

44. As per claims 32, 40, Bean teaches wherein the virtual machine monitor dynamically composes virtual-to-physical translations with the physical-to-machine translations (Column 29, lines 35-55).

45. As per claims 33, 41, Bean teaches wherein the virtual machine monitor inspects the virtual-to-physical mappings by the operating system and maintains page tables of virtual-to-machine mappings (Column 29, lines 35-55).

46. As per claims 34, 42, Bean teaches wherein a translation lookaside buffer is loaded with the virtual-to-machine translations (Column 30, lines 20-25).

47. As per claim 7, Bean teaches wherein the virtual machine monitor dynamically composes virtual-to-physical translations with physical-to-machine translations (Column 6, lines 35-50).

48. As per claim 8, Bean teaches wherein the virtual machine monitor inspects the virtual-to-physical mappings by the operating system and maintains page tables of virtual-to-machine mappings (Column 29, lines 35-50).

49. As per claim 9, Bean teaches loading a translation lookaside buffer with virtual-to-machine translations (Column 30, lines 20-25).

50. As per claim 11, Bean teaches virtualizing both the CPU and the memory (Colum 22, lines 61-68). However, Bean does not specifically teach that the CPU must be virtualized prior to the virtualization of the memory. However, since the order of hardware virtualization does not matter in the field of virtual machines, it would have been obvious to one having ordinary skill in the art to virtualize all hardware in any preferred order, including CPU before memory.

51. As per claims 26, 54, 66, Bean does not specifically teach wherein managing the address translation includes having the virtual machine monitor cease to inspect the operating system's virtual-to-physical translations; and ceasing to maintain a page table of direct virtual-to-machine mappings. However, Bean teaches assigning memory from a guest to a host, therefor devirtualizing the memory that was originally intended for the guest (Column 22, lines 47-55). It would have been obvious to one having ordinary skill in the art at the time of the applicant's invention that the composite translation will stop since that memory no longer belongs to the guest that needs virtual memory.

52. As per claim 44, Bean teaches a method of running a virtual machine monitor on computer hardware and an operating system on the virtual machine monitor, the hardware including memory, the memory virtualized by the virtual machine monitor, the method comprising devirtualizing the memory at runtime (Column 22, lines 47-55; Column 29, lines 33-55: memory resources that were originally mapped to a virtual machine guest and is later remapped to the host is considered from being virtualized to being devirtualized, since the host uses real addresses while the virtual machine uses virtual addresses; Column 1, lines 50-58; Column 2, lines 1-11).

Bean does not specifically state wherein the virtual machine monitor virtualizes the memory when multiple operating system instances are running and devirtualizes the memory when a single operating system instance is running.

However, Bean teaches, in column 8, line 24; Column 9, line 63-65; Column 22, lines 47-55; Column 29, lines 33-55, that under the specific circumstance when one guest out of two guests is terminated, and its memory gets reassigned to the host, there is only one guest with its OS that is running. Therefore, devirtualization occurs though this reassignment of memory.

53. As per claim 45, Bean teaches wherein a portion of the memory is devirtualized (Column 22, lines 47-55).

54. As per claim 46, Bean teaches wherein when the operating system is booted, the virtual machine monitor exposes the booting operating system to physical memory no larger than machine memory, where the physical memory does not span any memory holes (Column 1, lines 55-58: for a V=R guest, the virtual address correspond directly to the real address, therefore it can't be larger than the machine memory.).

55. As per claim 47, Bean teaches wherein the operating system defines virtual-to-physical translations prior to the runtime devirtualization (Column 30, lines 5-8); wherein the virtual machine monitor defines physical-to-machine translations prior to the runtime devirtualization (Column 29, lines 30-45); wherein the virtual machine monitor composes dynamically the virtual-to-physical translations with the physical-to-machine

translations prior to the runtime devirtualization, wherein the runtime devirtualization includes having the virtual machine monitor cease to perform the dynamic composition of translations (Column 22, lines 47-55; Column 29, lines 33-55: when the memory resource is assigned to a guest, composite translation is necessary, however, when it gets assigned to the host, that memory is devirtualized, and translation is no longer necessary.).

56. As per claim 48, Bean teaches wherein the devirtualization includes remapping physical memory so a physical-to-machine mapping becomes an Identity mapping; and using the operating system to manage address translation with respect to the devirtualized memory (Column 29, lines 45-50; Column 30, lines 5-8).

57. As per claim 49, Bean teaches wherein pages of physical memory that are already Identity-mapped are not remapped, and wherein at least some other pages of physical memory are remapped directly (Column 22, lines 47-55; Column 29, lines 33-55: memory resources that are already part of the host do not need to be remapped, only the memory that originally belonged to a guest needs to be remapped.).

58. As per claim 50, Bean teaches wherein pages of physical memory that are already Identity-mapped are not remapped, and wherein at least some other pages of

physical memory are remapped indirectly (Column 22, lines 47-55; Column 29, lines 33-55).

59. Claims 20-22, 51-53, 63-65 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bean et al., Patent No. 4,843,541 (hereafter Bean) in view of Chu, Patent No. 6,256,657 (hereafter Chu).

60. Chu was cited in the previous office action.

61. As per claims 20, 51, 63, Bean does not specifically teach wherein the remapping of the physical memory is performed concurrently with operating system and application activity.

However, Chu teaches operating system and related activities performs remapping, thus remapping occurs concurrently with operating systems for the purpose of having the operating system perform the job of remapping (Column 6, lines 56-67).

It would have been obvious to one having ordinary skill in the art at the time of the applicant's invention to combine the teachings of Bean with wherein the remapping of the physical memory is performed concurrently with operating system and application activity, as taught by Chu, because it allows the operating system to perform remapping.

62. As per claims 21, 22, 52, 64, 53, 65, Chu teaches preventing the physical-to-machine mapping from being modified during the remapping, and temporarily preventing some or all write accesses to memory (Column 9, lines 60-Column 10, line 18).

63. Claims 23-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bean et al., Patent No. 4,843,541 (hereafter Bean) in view of Waldspurger, Patent No. 6,789,156 (hereafter Waldspurger).

64. Waldspurger was cited in the previous office action.

65. As per claim 23, Bean does not specifically teach maintaining a back map that contains for each page of machine memory a list of the pages of physical memory that map to it, and a list of free machine pages.

However, Waldspurger teaches a back map for the purpose of identifying all the contexts that are sharing the same memory page, or in other words, all contexts that are mapped onto the same page. (Column 14, lines 17-24; Column 29, lines 27-28).

It would have been obvious to one having ordinary skill in the art at the time of the applicant's invention to combine the teachings of Bean with maintaining a back map, as taught by Waldspurger, because it allows the system to identify all contexts that are mapped to the same page.

66. As per claim 24, Waldspurger teaches wherein the remapping is performed without a back map by maintaining a reference count for each machine page is kept, and freeing machine pages when their reference counts are zero (Column 14, lines 12-43; Column 20, lines 29-33).

67. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bean et al., Patent No. 4,843,541 (hereafter Bean) in view of Bugnion et al., Patent No. 6,296,847 (hereafter Bugnion).

68. Bugnion was cited in the previous office action.

69. As per claim 3, Bean does not specifically teach wherein mapping is constructed prior to runtime.

However, Bugnion teaches mapping may be constructed before the run time of virtual machine for the purpose of mapping restoration (Column 14, lines 50-55).

It would have been obvious to one having ordinary skill in the art at the time of the applicant's invention to modify the teachings of Bean with mapping is constructed prior to runtime, as taught by Bugnion, for the purpose of mapping restoration.

Response to Arguments

70. Applicant's arguments filed on 7/8/2008 have been fully considered but are not persuasive.

71. In the remark, the applicant argued that:

i) Bean does not teach waiting to commence virtualization of the memory until run time.

ii) Bean does not teach devirtualizing the memory at run time, instead it merely teaches reassigning resources.

72. The Examiner respectfully disagree with the applicant. As to point:

i) Because it is uncertain what the run time is, and the specification offers conflicting and confusing definitions, the Examiner interprets the run time as the run time of virtual machine monitor. Because the virtual machine monitor is responsible for the virtualization of memory for virtual machines that in turn runs on top of it, it is obvious that if the virtual machine monitor does not run, virtualization can not happen.

ii) The applicant never gave a specific, clear definition of what devirtualization is. Therefore, the Examiner has interpreted devirtualization of memory as any memory used by the virtual machine guest that does not have to go through the VMM for translation or any memory that does not belong to the virtual machine guest, since this kind of memory does not need to be translated

and virtualized. Bean clearly teaches this in Column 1, lines 50-58; Column 2, lines 1-11.

Furthermore, as another example of devirtualization, it is exactly the reassignment and remapping of resources that teaches the limitation of devirtualization. In column 22, lines 47-55; Column 29, lines 33-55, resources, which include memory, get reassigned from guest to host. When memory was assigned to be used by guests, there is an extra step of virtualizing that memory in order to provide the illusion to the guest that it is in control of all of the computer's memory, or at least that it has more than what it actually has (see Fig 7A). However, when that memory gets remapped from the guest back to the host, the virtualization is removed, or devirtualized, because the host does not need that illusion because it needs to know the real memory address in order to run itself. The Examiner notes that even in the specification when devirtualization is described, memory is merely being remapped during the process of devirtualization.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MENGYAO ZHE whose telephone number is (571)272-6946. The examiner can normally be reached on Monday Through Friday, 7:30 - 5:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Meng-Ai An can be reached on 571-272-3756. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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